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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of: MacQueen *et al.*

Serial No.: 09/489,420

Group Art Unit: 1711

Filed: January 21, 2000

Examiner: S. Berman

For: *Coating Having Macroscopic
Texture and Process for Making
Same*

Atty Docket No.: 0312-058-999

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AMENDMENT AND RESPONSE TO OFFICE ACTION

Honorable Commissioner for Patents
Washington, D.C. 20231

08/31/2001 TSM1 00000002 161150 09489420

01 FC:115 110.00 CH
02 FC:102 80.00 CH
03 FC:103 198.00 CH
In response to the Office Action of April 24, 2001, please amend the above
identified application as follows:

In the Specification

Please replace the paragraph beginning at page 10, line 29, with the following:

-- A preferred embodiment of a pre-cured coating mixture of the present invention comprises, by weight, 79.44% of a resin mixture comprising, by weight, 53.4% urethane acrylate (ALUA 1001, available from Congoleum Corporation, Mercerville, NJ), 8.8% ethoxylated diacrylate (SR 259 available from Sartomer, Exton, PA), 24.3% propoxylated diacrylate (SR 306 available from Sartomer, Exton, PA), 13.4% ethoxylated trimethylolpropane triacrylate (SR 454 available from Sartomer, Exton, PA), and 0.1% acylphosphine oxide (LUCERIN TPO available from BASF); 12.00% flatting agent

a¹
comprising 5 micron nylon particles (ORGASOL 2001 UD available from Elf Atochem, Philadelphia, PA); 6.25% texture-producing particles comprising 60 micron nylon 12 particles (ORGASOL 2002 ES 6 available from Elf Atochem, Philadelphia, PA); 2.00% alumina RCA having a particle size distribution in the range of 27-56 nm (NANOTEK ALUMINA #0100 available from Nanophase Technologies Corp. Burr Ridge, IL); and 0.31% prehydrolyzed silane as an RCA coupling agent comprising 0.21% 3-methacryloxypropyltrimethoxysilane (Z-6030 available from Dow Corning, Midland, MI), 0.015% glacial acetic acid, 0.015% deionized water, and 0.07% ethanol, prehydrolyzed as described in Example 1 below. --

Please replace the paragraph beginning at page 13, line 5, with the following:

a²
-- A preferred embodiment of a cured coating mixture of the present invention is a cured coating made from a pre-cured coating mixture comprising, by weight, 79.44% of a resin mixture comprising, by weight, 53.4% urethane acrylate (ALUA 1001, available from Congoleum Corporation, Mercerville, NJ), 8.8% ethoxylated diacrylate (SR 259 available from Sartomer, Exton, PA), 24.3% propoxylated diacrylate (SR 306 available from Sartomer, Exton, PA), 13.4% ethoxylated trimethylolpropane triacrylate (SR 454 available from Sartomer, Exton, PA), and 0.1% acylphosphine oxide (LUCERIN TPO available from BASF); 12.00% flattening agent comprising 5 micron nylon particles (Orgasol 2001 UD available from Elf Atochem, Philadelphia, PA); 6.25% texture-producing particles comprising 60 micron nylon 12 particles (ORGASOL 2002 ES 6 available from Elf Atochem, Philadelphia, PA); 2.00% nanometer-sized alumina RCA having a particle size distribution in the range of 27-56 nm (NANOTEK ALUMINA #0100 available from Nanophase Technologies Corp. Burr Ridge, IL); and 0.31% prehydrolyzed silane as an RCA coupling agent comprising 0.21% 3-methacryloxypropyltrimethoxysilane (Z-6030 available from Dow Corning, Midland, MI), 0.015% glacial acetic acid, 0.015% deionized water, and 0.07% ethanol, prehydrolyzed as described in Example 1 below. --

Please replace the paragraph beginning at page 17, line 12, with the following:

EXAMPLE 1

A4 This example describes a microscopic texture with good abrasion resistance, but poor cleanability. 60g of alumina (available as NANOTEK ALUMINA 0100 from Nanophase Technologies Corp., Burr Ridge, IL) having an average particle diameter range of 27-56 nm, 7.92g of prehydrolyzed 3-methacryloxypropyltrimethoxysilane (available as Z-6030 from Dow Corning, Midland, MI), 240g of a UV-curable resin (see Table 1 below for the resin composition), and about 200g of 0.5 in. diameter porcelain balls were added to a porcelain media mill. —

A5 Please replace the paragraph beginning at page 18, line 1, with the following:

-- Table 2: UV-Curable Resin Composition

Component	Manufacturer	Wt %
Urethane acrylate (ALUA 1001)	Congoleum (Mercerville, NJ)	53.4
Ethoxylated diacrylate (SR 259)	Sartomer (Exton, PA)	8.8
Propoxylated diacrylate (SR 306)	Sartomer (Exton, PA)	24.2
Ethoxylated trimethylolpropane triacrylate (SR 454)	Sartomer (Exton, PA)	13.3
Surfactant (DC 193)	DOW Corning (Midland, MI)	0.1
Acylphosphine oxide (LUCERIN TPO)	BASF	0.2

Please replace the paragraph beginning at page 18, line 17, with the following:

EXAMPLE 2

A4 This example shows a coating with macroscopic texture having good cleanability and scratch resistance. 31.17g of silica (available as NANOTEK SILICA 2000 from Nanophase Technologies Corp., Burr Ridge, IL) having an average particle diameter range of 15-33 nm, 10.51g of prehydrolyzed

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3-methacryloxypropyltrimethoxysilane (available as Z-6030 from Dow Corning, Midland, MI) prepared as described in Example 1, 100g of a UV-curable resin (see Table 2 below for resin composition). The mixture was hand stirred with a wooden spatula and then mixed with an ultrasonic probe for about 20 minutes. The pre-cured coating mixture was applied to flexible polyvinyl chloride floor substrates at room temperature with a spatula and distributed on the substrate with an air knife. These sheet vinyl substrates were then UV-cured under nitrogen (<500 ppm oxygen) using two H-bulbs set on high and a line speed of 100 fpm. Two passes under the lamps were made under these conditions. The resulting coating was transparent with a gloss value (at 60°) of about 11%. The coating also had a macroscopic wave-like texture and was found to be cleanable. A Taber scratch test consisting of scribing 5 concentric circles on the coated samples with a metal stylus weighted from 300 to 500g in 50g increments yielded no visible scratches on the coating surface. Using the qualitative scratch rating system, this coating was rated a 7. --

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Please replace the paragraph beginning at page 19, line 1, with the following:

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--Table 2: UV-Curable Resin Composition

29

Component	Manufacturer	Wt %
Urethane acrylate (ALUA 1001)	Congoleum (Mercerville, NJ)	53.4
Ethoxylated diacrylate (SR 259)	Sartomer (Exton, PA)	8.8
Propoxylated diacrylate (SR 306)	Sartomer (Exton, PA)	24.2
Ethoxylated trimethylolpropane triacrylate (SR 454)	Sartomer (Exton, PA)	13.3
Surfactant (DC 193)	DOW Corning (Midland, MI)	0.1
Acylphosphine oxide (LUCERIN TPO)	BASF	0.2

Please replace the paragraph beginning at page 19, line 22, with the following:

— EXAMPLE 4

C8 Tests were conducted to determine the effects of silane as a coupling agent on the dispersion of nanometer-sized alumina. 2g of NANOTEK ALUMINA 0100 having an average particle diameter range of 27-56 nm was added to 10g of each of the following liquids: ethoxylated diacrylate (available as SR 259 from Sartomer, Exton, PA), propoxylated diacrylate (available as SR 306 from Sartomer, Exton, PA), ethoxylated trimetholpropane triacrylate (available as SR 454 from Sartomer, Exton, PA), and urethane acrylate (available as ALUA 1001 from Congoleum, Mercerville, NJ). The mixtures were stirred, shaken, and then placed into an ultrasonic bath for 30 minutes. To some of these mixtures 0.24g prehydrolyzed silane, as prepared in Example 1, was added, and the mixture was stirred. The consistencies of each of these mixtures are described in the Table 3 below. —

Please replace the paragraph beginning at page 20, line 1, with the following:

— Table 3: Effects of Prehydrolyzed Silane

C9

Liquid	Dispersing Agent	Observations
SR 306	none	thixotropic paste
	silane	low viscosity liquid
SR 259	none	low viscosity liquid
	silane	low viscosity liquid
SR 454	none	thixotropic paste
	silane	low viscosity liquid
ALUA 1001	none	non-thixotropic cream
	silane	low viscosity liquid

Please replace the paragraph beginning at page 28, line 3, with the following:

→ EXAMPLE 12

C10
This example demonstrates the use of an organic RCA. 20g of an organic (castor wax derivative) RCA THIXIN R (Rheox Inc., Hightstown, NJ) was added to 480g of the pre-cured UV resin described in Table 2 and mixed with a Cowles blade mixer. The mixture was then heated at 70°C until the THIXIN R dissolved. The mixture was then allowed to cool to room temperature. The viscosity of this mixture at a shear rate of 0.150 s⁻¹ at room temperature was 243,000 cPs. This mixture was then coated on flexible sheet vinyl using an air knife and cured under inert conditions. The resulting cured coating was transparent and had a wave-like macroscopic texture. When scratched using the Taber scratch test, no visible scratches were observed. →

Please replace the paragraph beginning at page 28, line 14, has been amended as follows:

— EXAMPLE 13

C11
This example demonstrates the use of both an organic RCA and an inorganic flatting agent. 12g of THIXIN R organic RCA and 19.14g of ACEMATTE OK 412 (Degussa Corp.) silica flatting agent were added to 288g of the pre-cured UV resin described in Table 2 and mixed as in Example 12. This mixture was coated on a flexible vinyl sheet floor with an air knife and cured under both atmospheric and inert conditions. The resulting coating had a matte finish and wave-like texture. —

Please replace the paragraph beginning at page 28, line 22, with the following:

— EXAMPLE 14

C12
This example shows that wave-like macroscopic texture can be generated without the use of an RCA. 85.25g of Alua 2302 and 21.31g ALUA 1001 urethane acrylate oligomers (Congoleum Corp., Mercerville, NJ), 66.14g of ACTILANE 424 and 26.64g of ACTILANE 430 acrylate monomers (Akcros Chemicals, New Brunswick, NJ), 0.2g DC 193 surfactant, and 0.394g of LUCERIN TPO photoinitiator were added to a container at room

Q12 temperature. This mixture was heated to 70°C and mixed with a Cowles blade mixer. After cooling to room temperature, the pre-cured coating mixture was applied to flexible vinyl substrates, coated with an air knife, and UV-cured under inert conditions. The resulting coating was transparent and had macroscopic wave-like texture. —

Please replace the paragraph beginning at page 28, line 33, with the following:

— EXAMPLE 15

Q13 This example demonstrates the use of organic texture-producing particles and an inorganic flattening agent. 6.25g of ORGASOL 2002 ES 6 NAT (Elf Atochem, Philadelphia, PA) polyamide 12 texture-producing particle (60 μ m in diameter) and 5.625 g of ACEMATTE OK 412 flattening agent (3 μ m diameter) were added to 88.125g of the pre-cured UV-resin described in Table 2 and mixed with a Cowles blade mixer. This mixture was heated to 70°C and coated on a flexible sheet vinyl floor using an air knife. The pre-cured coating was cured at a line speed of 100 fpm using atmospheric and then inert conditions. The resulting coating was transparent coating with a matte finish and sandpaper-like texture. —

Please replace the paragraph beginning at page 29, line 6, with the following:

— EXAMPLE 16

Q14 This example shows the effects of the size of the texture-producing particles on the cured coating texture. Four pre-cured coating mixtures were prepared as in Example 15 where 6.25% of ORGASOL 2002 polyamide 12 texture-producing particles was added to the pre-cured UV-resin described in Table 2. The four mixtures differed in that each contained a different sized particle of ORGASOL 2002: 30 μ m (grade ES 3), 40 μ m (grade ES 4), 50 μ m (grade ES 5), and 60 μ m (grade ES 6). Each mixture was applied at 70°C to sheet vinyl and coated with an air knife. All coatings were UV-cured under inert conditions. The cured coating containing the 30 μ m particles had a visibly fairly smooth surface with a matte finish. The coatings with the larger particles had progressively more visible texture as the particle size increased, where the 60 μ m particles gave the most visible and aggressive (largest textural features) texture. The scratch resistance of the coatings improved with

Q14
increasing particle size, where 60 μm showed almost no visible scratches after the Taber scratch test. FIG. 9 is a photograph of the top of a portion of the coated substrate produced using the 60 μm particles, and FIG. 10 is a photograph of the top of a portion of the coated substrate produced using the 40 μm particles. The difference in the aggressiveness of the texture is evident. It should be appreciated, however, that the concentration of particles used would also be expected to have an influence on textural aggressiveness.—

Please replace the paragraph beginning at page 30, line 16, with the following:

—EXAMPLE 17

Q15
This example describes textured coatings containing organic texture-producing particles, an inorganic RCA with a coupling agent, and both organic and inorganic flatting agents. Per-cured coating mixtures having the composition shown in Table 9 were mixed with a Cowles blade mixer.

Table 9: Pre-Cured Coating Mixture Compositions in Weight Percent

Component	Coating A	Coating B
UV-Curable Resin from Table 2	85.62	85.95
ORGASOL 2002 ES 6 (60 μm texture-producing particle)	6.12	6.25
ORGASOL 2001 UD (5 μm organic flatting agent)	6.0	0
ACEMATTE OK 412 (3 μm inorganic flatting agent)	0	5.49
NANOTEK ALUMINA (inorganic RCA)	1.96	2
Prehydrolyzed Z-6030 (coupling agent from Example 1)	0.30	0.31

Both coatings were applied to flexible sheet vinyl at 70°C and coated with an air knife. These coated substrates were UV-cured under atmospheric and then inert environments. The resulting cured coatings were transparent and had sandpaper-like macroscopic texture and matte finishes.—

In the Claims

Please cancel claims 7 and 17.

Please amend claims 1-6, 8-16, and 18-23 as follows:

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1. (Amended Once) A pre-cured coating mixture, comprising:
a radiation-curable resin; and
an initiator;
wherein said radiation-curable resin and said initiator form a pre-cured coating mixture having a viscosity of approximately 100,000-1,000,000 cPs at a shear rate of 0.150 s⁻¹ that is capable of forming a macroscopic texture upon application of said pre-cured coating mixture on a substrate.
 2. (Amended Once) The pre-cured coating mixture of claim 1 wherein said radiation-curable resin comprises radiation-curable oligomers and monomers comprising approximately 1-20 radiation-curable groups per molecule.
 3. (Amended Once) The pre-cured coating mixture of claim 2 wherein said radiation-curable groups are selected from the group consisting of acrylate, oxirane, vinyl ether, hydroxyl, lactone, and mixtures thereof.
 4. (Amended Once) The pre-cured coating mixture of claim 1 wherein said radiation-curable resin is selected from the group consisting of radiation-curable urethane acrylate, radiation-curable ethoxylated diacrylate, radiation-curable propoxylated diacrylate, radiation-curable ethoxylated trimethylolpropane triacrylate, and mixtures thereof.
 5. (Amended Once) The pre-cured coating mixture of claim 1 wherein said radiation-curable resin comprises approximately 50-99%, by weight, of said pre-cured coating mixture.

Q16 6. (Amended Once) The pre-cured coating mixture of claim 1 wherein said initiator is selected from the group consisting of a free radical photoinitiator, a cationic photoinitiator, and mixtures thereof.

8. (Amended Once) The pre-cured coating mixture of claim 1 further comprising a rheological control agent, wherein said radiation-curable resin, said initiator, and said rheological control agent form said pre-cured coating mixture having a viscosity of approximately 100,000-1,000,000 cPs at a shear rate of 0.150 s^{-1} that is capable of forming a macroscopic texture upon application of said pre-cured coating mixture on a substrate.

9. (Amended Once) The pre-cured coating mixture of claim 8 wherein said rheological control agent is selected from the group consisting of inorganic particles, organic solids, and mixtures thereof.

Q17 10. (Amended Once) The pre-cured coating mixture of claim 9 wherein said rheological control agent comprises inorganic particles selected from the group consisting of alumina, silica, fumed alumina, fumed silica, aluminosilicate, alumina coated on silica, metal oxides, metal, carbonates, clays, and mixtures thereof.

11. (Amended Once) The pre-cured coating mixture of claim 9 wherein said rheological control agent comprises inorganic particles having an approximate size in the range from 27-56 nanometers.

12. (Amended Once) The pre-cured coating mixture of claim 9 wherein said rheological control agent comprises inorganic particles comprising nanometer-sized alumina.

13. (Amended Once) The pre-cured coating mixture of claim 9 wherein said rheological control agent comprises inorganic particles comprising aluminosilicates.

14. (Amended Once) The pre-cured coating mixture of claim 9 wherein said rheological control agent comprises inorganic particles comprising approximately 1-80%, by weight, of said pre-cured coating mixture.

Q17 15. (Amended Once) The pre-cured coating mixture of claim 9 wherein said rheological control agent comprises organic solids selected from the group consisting of low molecular weight waxes, polymers of ethylene glycol, polymers of propylene glycol, natural polymers, polyamides, polypropylene, and mixtures thereof.

16. (Amended Once) The pre-cured coating mixture of claim 9 wherein said rheological control agent comprises organic solids comprising approximately 1-50%, by weight, of said pre-cured coating mixture.

18. (Amended Once) The pre-cured coating mixture of claim 9 further comprising a coupling agent.

19. (Amended Once) The pre-cured coating mixture of claim 1 further comprising a plurality of texture-producing particles.

B Q18 SUB B17 20. (Amended Once) The pre-cured coating mixture of claim 57 further comprising:
a flatting agent comprising 5 micron-sized nylon particles; and
wherein said radiation-curable resin comprises a mixture of urethane acrylate, ethoxylated diacrylate, propoxylated diacrylate, and ethoxylated trimethylolpropane triacrylate, and wherein said initiator comprises acylphosphine oxide.

21. (Amended Once) The pre-cured coating mixture of claim 46 wherein said plurality of texture-producing particles are selected from the group consisting of glass, ceramic, alumina, silica, aluminosilicates, alumina coated on silica, polyamide, polypropylene, polyethylene, polytetrafluoroethylene, ethylene copolymers, waxes, epoxy, urea-formaldehyde, nylon, and mixtures thereof.

22. (Amended Once) The pre-cured coating mixture of claim 46 wherein said plurality of texture-producing particles comprises nylon 12.

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23. (Amended Once) The pre-cured coating mixture of claim 46 wherein said plurality of texture-producing particles have a diameter of approximately 30-350 microns.

Please add new claims 46-58 as follows:

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46. (New) A pre-cured coating mixture, comprising:
a radiation-curable resin;
an initiator;
a rheological control agent;
a plurality of texture-producing particles; and
wherein said radiation-curable resin, said initiator, said rheological control agent, and said plurality of texture-producing particles form a pre-cured coating mixture capable of forming a macroscopic texture upon application of said pre-cured coating mixture on a substrate.

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47. (New) The pre-cured coating mixture of claim 46 wherein said rheological control agent is selected from the group consisting of inorganic particles, organic solids, and mixtures thereof.

48. (New) The pre-cured coating mixture of claim 47 wherein said rheological control agent comprises inorganic particles selected from the group consisting of alumina, silica, fumed alumina, fumed silica, aluminosilicate, alumina coated on silica, metal oxides, metal, carbonates, clays, and mixtures thereof.

49. (New) The pre-cured coating mixture of claim 47 wherein said rheological control agent comprises inorganic particles having an approximate size in the range from 27-56 nanometers.

50. (New) The pre-cured coating mixture of claim 47 wherein said rheological control agent comprises inorganic particles comprising nanometer-sized alumina.

51. (New) The pre-cured coating mixture of claim 47 wherein said rheological control agent comprises inorganic particles comprising aluminosilicates.

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B37 52. (New) The pre-cured coating mixture of claim 47 wherein said rheological control agent comprises inorganic particles comprising approximately 1-80%, by weight, of said pre-cured coating mixture.

53. (New) The pre-cured coating mixture of claim 47 wherein said rheological control agent comprises organic solids selected from the group consisting of low molecular weight waxes, polymers of ethylene glycol, polymers of propylene glycol, natural polymers, polyamides, polypropylene, and mixtures thereof.

A19 54. (New) The pre-cured coating mixture of claim 47 wherein said rheological control agent comprises organic solids comprising approximately 1-50%, by weight, of said pre-cured coating mixture.

55. (New) The pre-cured coating mixture of claim 47 further comprising a coupling agent.

4. 56. (New) The pre-cured coating mixture of claim 46 wherein said pre-cured coating mixture has a viscosity of approximately 100,000-1,000,000 cPs at a shear rate of 0.150 s^{-1} .

57. (New) The pre-cured coating mixture of claim 46 further comprising:
a coupling agent comprising prehydrolyzed silane; and
wherein said plurality of texture-producing particles comprises 60 micron-sized nylon 12 particles and said rheological control agent comprises a plurality of alumina particles having an approximate size in the range of 27-56 nanometers.

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B47 58. (New) The pre-cured coating mixture of claim 57 further comprising:
a flattening agent comprising 3 micron-sized nylon particles; and

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[illegible]

REMARKS

Following are Applicants' remarks corresponding to each item raised in the Office Action.

Election/Restrictions

Applicants hereby confirm the election of claims 1-23 without traverse.

Specification

The Examiner has noted the use of trademarks in the specification. Applicants believe that each such use is accompanied by generic terminology. In addition, Applicants have amended the specification to provide for the capitalization of each letter of each such trademark throughout the specification. Therefore, Applicants believe they are in full compliance with the use of trademarks in the specification.

Rejections Under 35 U.S.C. § 112

Each of the Examiner's rejections under 35 U.S.C. § 112 will be addressed in the same order in which the Examiner raised them in the Office Action.

Claim 1

The Examiner has rejected claims 1-23 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter of the invention. Specifically, the Examiner has rejected claim 1 as not being clear as to what feature of the pre-cured coating mixture would provide a macroscopic texture.

Applicant's have amended claim 1 to require that the pre-cured coating mixture have a viscosity of approximately 100,000-1,000,000 cPs at a shear rate of 0.150 s^{-1} . It is this viscosity level that allows the pre-cured coating mixture to take and maintain a macroscopic texture upon application onto a substrate. Given the specification and the examples therein, one of skill in the art would understand how to obtain such a viscosity in the pre-cured coating mixture utilizing the claimed components.

Typically, other pre-cured coating mixtures have a significantly lower viscosity to insure that the mixture can be applied or fashioned in an even or smooth surface.

However, the pre-cured coating mixture of claim 1 has a significantly higher viscosity to enable the formation of a macroscopic texture once applied and cured on a substrate.

New independent claim 46 claims the combination of a rheological control agent and texture producing particles that provide the pre-cured coating mixture with the capability of forming a macroscopic texture upon application to a substrate. As defined in the specification, the texture-producing particles have an effective size or an average diameter that is larger than the pre-cured coating thickness after it has been applied to a substrate, thereby imparting the macroscopic texture. The rheological control agent is provided to increase the viscosity of the pre-cured coating mixture to assist in the formation of the macroscopic texture, although in this particular claim it is noted that the viscosity does not necessarily need to be on the order of 100,000 cPs and may, in fact, be much less.

Based on the foregoing, Applicants believe that independent claims 1 and 46 fully comply with 35 U.S.C. § 112.

Pre-cured Coating Mixture

The Examiner has suggested that “pre-cured coating mixture” be replaced with “radiation curable coating mixture,” since “pre-cured” coating mixture conventionally means a coating that has been partially or fully cured before coating. Applicants respectfully traverse this suggestion, since Applicants believe that “pre-cured coating mixture” has been adequately defined in the specification. “Pre-cured” is defined in the specification at page 6, line 9, as prior to curing. Therefore, pre-cured coating mixture cannot refer to a mixture that has been fully cured. Furthermore, the specification describes the process for using the pre-cured coating mixture at page 12, lines 13-14, as applying the pre-cured coating mixture to a substrate followed by radiation-curing (emphasis added). Therefore, it is clear that “pre-cured” does not refer to a partially cured state, since no curing would occur prior to the application of radiation to the pre-cured coating mixture. As such, Applicants believe that it is clear that pre-cured coating mixture refers to a mixture that is applied to a substrate and subsequently cured and not to a partially or fully cured mixture.

Claim 4

The Examiner has rejection claim 4, since the Markush Group of radiation curable resins included acylphosphine oxide, which is an initiator. Applicants have amended claim 4 to remove acylphosphine oxide from this list.

Claims 7 and 17

The Examiner has rejected claims 7 and 17 based on a failure to define the viscosity that would be effective to form the macroscopic texture. Applicants have canceled these claims.

Claim 8

The Examiner rejected claim 8 as not being clear. Claim 8 has been amended to clearly recite that it is the pre-cured coating mixture of claim 1 further comprising a rheological control agent and that the radiation-curable resin, the initiator, and the rheological control agent form the pre-cured coating mixture.

Claim 15

The Examiner has rejected claim 15, since the phrase "natural polymer" is not clear. Applicants respectfully traverse this rejection and direct the Examiner's attention to page 9, line 6-7, wherein examples of natural polymers are given, including guar, gelatin, and corn starch. One of skill in the art would know from this exemplary list the meaning of the term "natural polymer."

Claim 19

The Examiner has rejected claim 19 as failing to define the particle size effective to form the macroscopic texture and because it is not clear whether "plurality of particles" refers to an amount of particles or different kinds of particles. Applicants have amended claim 19 to simply recite that the pre-cured coating mixture of claim 1 further comprises a plurality of texture-producing particles, which is clearly defined in the specification as discussed above.

Claim 20

With respect to claim 20, the Examiner notes that claim 20 recites “the coating mixture of claim 1 further comprising” and has suggested that the claim 20 be amended to state “the coating mixture of claim 1 wherein the radiation curable resin comprises a mixture of . . . and the initiator is Applicants respectfully traverse this suggestion, since claim 20, as amended, does recite an additional component of the pre-cured coating mixture, namely a flatting agent. Therefore, Applicants believe that the use of the words “further comprising” is appropriate.

Claim 21-23

The Examiner has rejected claims 21-23 based on a lack of antecedent basis for “coated substrate.” Applicants have amended these claims to properly claim dependency to the pre-cured coating mixture of claim 46.

Claims 1, 2, 5, 6 and 7

The Examiner has rejected claims 1, 2, 5, 6, and 7 as being indefinite for failure to point out what is included or excluded by the claim language and as being omnibus claims. In light of the amendments to independent claim 1, from which claims 2, 5, and 6 depend, and in light of the cancellation of claim 7, Applicants believe that claims 1, 2, 5, and 6 fully comply with 35 U.S.C. § 112.

As discussed above, independent claim 1 now requires that the combination of the radiation-curable resin and the initiator form a pre-cured coating mixture that has a viscosity of 100,000-1,000,000 cPs at a shear rate of 0.150 s^{-1} , and it is this property of the pre-cured coating mixture (i.e., its viscosity) that enables the formation of the macroscopic texture upon application of the pre-cured coating mixture to a substrate. Dependent claims 2 and 5 simply further specify the type of radiation-curable resin, and dependent claim 6 simply specifies the type of initiator. Therefore, these claims clearly specify a limitation on what combinations of radiation-curable resins and initiators may be used, namely, only those combinations resulting in the claimed viscosity may be used.

Similarly, with respect to independent claim 46, this claim requires the combined use of texture-producing particles and a rheological control agent. Therefore,

Applicants believe that such claim also clearly specifies a limitation on the pre-cured coating mixture.

Moreover, Applicants assert that the claims as amended are not omnibus type claims nor are they omnibus type claims for the reasons put forth by the Examiner. Omnibus type claims are claims that fail to point out what is included or excluded by the claim language. Independent claims 1 and 46 clearly point out what components are included in the pre-cured coating mixture. Furthermore, the Examiner's assertion that all known radiation curable compositions comprising an initiator and also comprising any kind of particles or rheological control agent would be expected to provide a macroscopic texture upon curing is not a proper basis for rejection of these claims under 35 U.S.C. § 112. The Examiner's assertion appears to be more directed to the breadth of the claims rather than to issues of indefiniteness, which is more properly the basis for a prior art rejection (see MPEP §2173.04, which states that breadth is not indefiniteness).

Regardless, the Examiner's assertion that all known radiation curable compositions comprising an initiator and also comprising any kind of particles or rheological control agent would be expected to provide a macroscopic texture upon curing is not correct. For example, some combinations of resins, initiators, and rheological control agents may have a viscosity that is too low to form or maintain a macroscopic texture. Similarly, some combinations of resins, initiators, and particles may utilize particles for providing low gloss, where the particles are too small to provide any type of macroscopic texture.

Based on the foregoing, Applicants believe they have complied with 35 U.S.C. § 112. Therefore, Applicants respectfully request withdraw of the foregoing rejections.

Rejections Under 35 U.S.C. § 102

Before addressing each of the Examiner's rejections, the present invention, as claimed in the only two independent claims, 1 and 46, is described. Claim 1 recites a combination of a radiation-curable resin and an initiator that form a pre-cured coating mixture having a viscosity of 100,000-1,000,000 cPs at a shear rate of 0.150 s^{-1} , and it is this property of the pre-cured coating mixture (i.e., its viscosity) that enables the formation of the macroscopic texture upon application of the pre-cured coating mixture to a substrate. Claim 46 recites a combination of a radiation-curable resin; an initiator; a rheological control agent;

a plurality of texture-producing particles that form a pre-cured coating mixture capable of forming a macroscopic texture upon application of said pre-cured coating mixture on a substrate, and it is the combination of a rheological control agent and the texture-producing particles that enable the formation of the macroscopic texture upon application of the pre-cured coating mixture to a substrate.

Each of the Examiner's rejections are addressed below in the same order in which the Examiner raised them. Initially, the Examiner noted that claims 10-15 do not limit the rheological control agent to either inorganic particles, organic solids, or mixtures thereof. Applicants have amended claims 10-16 to explicitly recite the rheological control agent as either inorganic particles or organic solids.

Slosberg

The Examiner has rejected claims 1, 2, 5, 7-10, 15, 17, 19, and 21 as being anticipated by Slosberg et al. Slosberg teaches the curing of rubber to produce particles that are subsequently included in a thermoplastic resin matrix material. This material is then fused by hot pressing. The fused product may then be applied to another substrate to result, for example, in the floor tile product of FIG. 2. Slosberg, however, does not teach or suggest a pre-cured coating mixture having a viscosity of 100,000-1,000,000 cPs at a shear rate of 0.150 s^{-1} that is capable of forming a macroscopic texture upon application to a substrate. Nor does Slosberg teach or suggest texture-producing particles of the present invention, which are defined as having an average diameter larger than the pre-cured coating thickness after it has been applied to a substrate, or a rheological control agent. Moreover, Slosberg does not teach or suggest that combination of texture-producing particles and a rheological control agent. The rubber particles of Slosberg as shown in FIG. 2 and as described at column 2, lines 58-60, clearly have an average diameter that is less than the thickness of the layer of which they are a part. In addition, the Examiner's citation to column 3, lines 4-7, is a description of the curing of the rubber particles before their incorporation into the matrix. Therefore, Slosberg does not teach or suggest each and every element of the present invention as recited in independent claims 1 and 46 and withdraw of this rejection is respectfully requested.

McDowell

The Examiner has rejected claims 1-10, 14, 16, 18, 19, and 21 as being anticipated by McDowell. McDowell is directed to curable compositions that provide a low gloss appearance. More specifically, McDowell teaches a two step process in which the composition is first subjected to actinic light in an oxygen-containing atmosphere under conditions effective to cure the composition except for the surface and second subjected to actinic light in an oxygen-containing atmosphere under conditions effective to cure the surface. The composition used contains a flattening agent, such as silica. Typically, flattening agents are microscopic particles that are used to provide a dull appearance or low gloss effect; however, such flattening agents do not provide macroscopic texture. McDowell describes the disclosed coating compositions as being prepared and applied by conventional methods and as providing "smooth, uniform films (see column 10, lines 17-24). Furthermore, McDowell cautions against using too much flattening agent to avoid an increase in viscosity such that proper application of the coating composition cannot be maintained (see column 2, lines 11-14). Therefore, McDowell does not teach or suggest the use of a pre-cured coating mixture having a viscosity of 100,000-1,000,000 cPs at a shear rate of 0.150 s^{-1} that is capable of forming a macroscopic texture upon application to a substrate. Nor does McDowell teach or suggest texture-producing particles having an average diameter larger than the pre-cured coating thickness after it has been applied to a substrate, which is evident from the teaching of McDowell wherein the process described results in forcing a small amount of silica to the surface (see column 11, lines 21-26). Obviously, if the texture-producing particles had an average diameter larger than the thickness of the coating as applied to a substrate, it would be difficult for the particles to be forced to the surface, since they would already be exposed. Moreover, McDowell does not teach or suggest the combination of texture-producing particles and a rheological control agent. Therefore, McDowell does not teach or suggest each and every element of the present invention as recited in independent claims 1 and 46 and withdraw of this rejection is respectfully requested

Miller

The Examiner has rejected claims 1-10, 14, 16, 18, 21, and 23 as being anticipated by Miller. Miller teaches a non-skid floor covering having particles distributed throughout a matrix with the upper most layer of particles protruding from the matrix.

However, Miller does not teach or suggest the use of a pre-cured coating mixture having a viscosity of 100,000-1,000,000 cPs at a shear rate of 0.150 s^{-1} that is capable of forming a macroscopic texture upon application to a substrate. In fact, Miller describes the viscosity of the matrix as being between 4000 and 12,000 cPs (see column 6, lines 45-52), which is approximately an order of magnitude lower than that required by claim 1 of the present invention. Furthermore, Miller does not teach or suggest a pre-cured coating mixture having texture-producing particles having an average diameter larger than the pre-cured coating thickness after it has been applied to a substrate. In fact, Miller teaches that sufficient matrix is deposited to hold more than a monolayer of particles (see column 6, lines 47-50 and FIG. 3). Therefore, the particles taught by Miller are not texture-producing particles as that term is defined in the present invention and used in claim 46. Lastly, Miller does not teach or suggest the combination of texture-producing particles and a rheological control agent. As such, Miller does not teach or suggest each and every element of the present invention as recited in independent claims 1 and 46 and withdrawal of this rejection is respectfully requested.

Troue

The Examiner has rejected claims 1-9 and 14-17 as being anticipated by Troue. Troue teaches the production of a coating having ultra-fine texture, which appears to represent a semi-gloss surface as opposed to a low-gloss surface (see column 11, lines 6-11 and 45-53), and which is produced by the use of UV light to first increase the viscosity of the coating as applied and thereafter exposing the coating to UV light at a given wavelength, maintaining the coating in a space absent UV light and finally exposing the coating to UV light again but at a different wavelength. Troue teaches that such semi-gloss surface would have a more shallow depth than the texture of a low-gloss surface (see column 11, lines 45-53). Therefore, it appears that the texture of Troue is not macroscopic. More importantly, however, is the fact that Troue only teaches the use of viscosities greater than 50 cPs (see column 2, lines 3-5) but not greater than 10,000 cPs (see column 6, lines 17-25). Moreover, the viscosity increasing step is taught as substantially increasing the viscosity, which represents at least about 25% (see column 6, lines 34-36). Therefore, even assuming the use of the maximum viscosity material and a substantial increase in that viscosity of 25%, the resulting viscosity is only 12,500 cPs, which is still approximately an order of magnitude less

than that claimed in claim 1 of the present invention. Therefore, Troue does not teach or suggest a pre-cured coating mixture having a viscosity of 100,000-1,000,000 cPs at a shear rate of 0.150 s^{-1} that is capable of forming a macroscopic texture upon application to a substrate. Furthermore, Troue does not teach or suggest a pre-cured coating mixture having texture-producing particles nor does Troue teach the use of a rheological control agent or the combination of these components as claimed in claim 46. In fact, Troue teaches a coating having desirable rheological properties without the use of an additive (see column 1, lines 56-63). As such, Troue does not teach or suggest each and every element of the present invention as recited in independent claims 1 and 46 and withdraw of this rejection is respectfully requested.

Courtoy et al.

The Examiner has rejected claims 1-7 as being anticipated by Courtoy. Courtoy teaches a graining operation to impart a matte effect in a certain area of the covering. However, Courtoy does not teach or suggest a pre-cured coating mixture having a viscosity of 100,000-1,000,000 cPs at a shear rate of 0.150 s^{-1} that is capable of forming a macroscopic texture upon application to a substrate as recited in claim 1. Furthermore, Courtoy does not teach or suggest a pre-cured coating mixture having texture-producing particles and a rheological control agent as recited in claim 46. As such, Courtoy does not teach or suggest each and every element of the present invention as recited in independent claims 1 and 46 and withdraw of this rejection is respectfully requested.

Takahashi

The Examiner has rejected claims 1-9, 19 and 23 as being anticipated by Takahashi. Takahashi teaches a decorative sheet having a protective layer containing fine particles on a substrate. Takahashi, however, limits the protective layer to a thickness of ^{upto} 50 micrometers (see column 3, lines 46-52) and the particle size to 0.1 to 50 micrometers (see column 3, lines 63-67). Based on the foregoing, as well as FIG.1 of Takahashi, it is clear that the particles do not have an average diameter that is larger than the pre-cured coating thickness after it has been applied to a substrate. Moreover, Takahashi does not teach or suggest the combination of texture-producing particles and a rheological control agent as recited in claim 46. Nor does Takahashi teach or suggest a pre-cured coating mixture having

a viscosity of 100,000-1,000,000 cPs at a shear rate of 0.150 s^{-1} that is capable of forming a macroscopic texture upon application to a substrate as recited in claim 1. As such, Takahashi does not teach or suggest each and every element of the present invention as recited in independent claims 1 and 46 and withdraw of this rejection is respectfully requested.

Gorzalski et al.

The Examiner has rejected claims 1-17, 19 and 21 as being anticipated by Gorzalski. Gorzalski teaches a coating composition to obtain a low gloss finish by the production of a fine, uniform surface wrinkling effect. More specifically, Gorzalski explicitly teaches that the low gloss effect is achieved by a uniform, microscopic surface wrinkling (see column 2, lines 35-38; column 9, lines 16-23; emphasis added). As such, Gorzalski does not teach a pre-cured coating mixture as recited in claims 1 and 46 for producing a macroscopic texture. Moreover, Gorzalski teaches the desirability of a satisfactorily low viscosity (see column 6, lines 31-37). Therefore, Gorzalski does not teach or suggest a pre-cured coating mixture having a viscosity of 100,000-1,000,000 cPs at a shear rate of 0.150 s^{-1} that is capable of forming a macroscopic texture upon application to a substrate as recited in claim 1. Furthermore, Gorzalski does not teach or suggest the combination of texture-producing particles and a rheological control agent as recited in claim 46. As such, Gorzalski does not teach or suggest each and every element of the present invention as recited in independent claims 1 and 46 and withdraw of this rejection is respectfully requested.

Based on the foregoing, Applicants do not believe that any of the references cited by the Examiner anticipate independent claims 1 and 46 as amended. Therefore, these references do not anticipate any of the claims depending from claims 1 and 46. As such, Applicants respectfully request withdraw of the foregoing rejections.

Rejections Under 35 U.S.C. § 103

The Examiner has rejected claims 1-19 and 21-23 under 35 U.S.C. § 103(a) as being unpatentable over Gorzalski et al. in view of Gallouedec et al. in the article entitled "Enhancement of Mechanical and Optical Properties of Waterborne Polyurethane Lacquers on Plastic Surfaces by Using Ultra-Fine Polyamide Powders. A New Approach to 'Soft Feel' Coatings." In light of the amended claims, Applicants respectfully traverse this rejection.

When rejecting claims under 35 U.S.C. § 103, the Examiner bears the burden of establishing a *prima facie* case of obviousness. Three criteria are required to establish a *prima facie* case of obviousness. First, the prior art reference, or references when combined, must teach or suggest each and every limitation of the claimed invention. Second, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify or combine the teachings of the references in the manner suggested by the Examiner. Finally, the skilled artisan, in light of the teachings of the prior art, must have a reasonable expectation that the modification or combination suggested by the Examiner would be successful. Both the teaching or suggestion to make the claimed invention and the reasonable expectation of success must be found in the prior art, not in Applicants' disclosure. If any one of these criteria is not met, *prima facie* obviousness has not been established.

Applicants submit that the combination of Gorzalski and Gallouedec do not teach or suggest each and every limitation of independent claim 1. As discussed above, Gorzalski teaches a coating composition to obtain a low gloss finish by the production of a fine, uniform surface wrinkling effect. More specifically, Gorzalski explicitly teaches that the low gloss effect is achieved by a uniform, microscopic surface wrinkling (see column 2, lines 35-38; column 9, lines 16-23; emphasis added). As such, Gorzalski does not teach a pre-cured coating mixture as recited in claims 1 and 46 for producing a macroscopic texture. Moreover, Gorzalski teaches the desirability of a satisfactorily low viscosity (see column 6, lines 31-37). Therefore, Gorzalski does not teach or suggest a pre-cured coating mixture having a viscosity of 100,000-1,000,000 cPs at a shear rate of 0.150 s^{-1} that is capable of forming a macroscopic texture upon application to a substrate as recited in claim 1.

Nor does Gallouedec, teach or suggest a pre-cured coating mixture having a viscosity of 100,000-1,000,000 cPs at a shear rate of 0.150 s^{-1} that is capable of forming a macroscopic texture upon application to a substrate as recited in claim 1. Gallouedec teaches

the use of 50-60% solids in a polyurethane lacquer to produce a textured coating having a "soft feel." Nowhere does Gallouedec discuss anything regarding the use of viscosity to provide a macroscopic texture as recited in claim 1. Furthermore, it is not clear whether the "soft-feel" texture as taught by Gallouedec is a macroscopic texture as recited in claim 1. Therefore, the combination of Gorzalski and Gallouedec does not teach or suggest each and every limitation of independent claim 1.

With respect to independent claim 46, Applicants assert that there is either no motivation to combine Gorzalski and Gallouedec or a failure to teach or suggest each and every limitation of claim 46. The Examiner states that it would have been obvious to one skilled in the art to [use] ultra-fine polyamide powders in the radiation curable compositions disclosed by Gorzalski to provide the textured coatings of Gallouedec. As noted above, it is not clear whether the texture of Gallouedec is a macroscopic texture, but therein lies the reason for a lack of motivation to combine these references. Assuming *arguendo* that the texture of Gallouedec is a macroscopic texture, one of skill in the art would not want to add the particles of Gallouedec to the compositions of Gorzalski, since Gorzalski is directed to obtaining a microscopic texture, whereas the addition of these particles would preclude the formation of such microscopic texture. Alternatively, if one of skill in the art was motivated to combine the particles of Gallouedec with the compositions of Gorzalski, then the "soft-feel" texture provided by the particles of Gallouedec must be consistent or within the scope of the microscopic texture desired by Gorzalski, i.e., the texture of Gallouedec must not be macroscopic. Therefore, in this case, neither Gorzalski nor Gallouedec teach or suggest a macroscopic texture as recited in independent claim 46.

Based on the foregoing, Applicants submit that the combination of Gorzalski and Gallouedec does not make a *prima facie* case of obviousness and withdraw of this rejection is respectfully requested.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. This attached page is captioned "Version With Markings to Show Changes Made." Also attached is a clean version of the entire set of pending claims. This page is entitled "Entire Set of Pending Claims."

In view of the above considerations, Applicants respectfully request a timely Notice of Allowance in this application.

No fees are believed to be owed with respect to this Amendment and Response to Office Action. However, any required fees may be charged to the Pennie & Edmonds LLP Deposit Account No. 16-1150.

Respectfully submitted,

Date August 24, 2001


David R. Owens 40,756
(Reg. No.)

for

Frank E. Morris 24,615
PENNIE & EDMONDS LLP
1155 Avenue of the Americas
New York, New York 10036-2711
(212) 790-9090

VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Specification:

Paragraph beginning at page 10, line 29, has been amended as follows:

A preferred embodiment of a pre-cured coating mixture of the present invention comprises, by weight, 79.44% of a resin mixture comprising, by weight, 53.4% urethane acrylate ([Alua] ALUA 1001, available from Congoleum Corporation, Mercerville, NJ), 8.8% ethoxylated diacrylate (SR 259 available from Sartomer, Exton, PA), 24.3% propoxylated diacrylate (SR 306 available from Sartomer, Exton, PA), 13.4% ethoxylated trimethylolpropane triacrylate (SR 454 available from Sartomer, Exton, PA), and 0.1% acylphosphine oxide ([Lucerin] LUCERIN TPO available from BASF); 12.00% flattening agent comprising 5 micron nylon particles ([Orgasol] ORGASOL 2001 UD available from Elf Atochem, Philadelphia, PA); 6.25% texture-producing particles comprising 60 micron nylon 12 particles ([Orgasol] ORGASOL 2002 ES 6 available from Elf Atochem, Philadelphia, PA); 2.00% alumina RCA having a particle size distribution in the range of 27-56 nm ([Nanotek Alumina] NANOTEK ALUMINA #0100 available from Nanophase Technologies Corp. Burr Ridge, IL); and 0.31% prehydrolyzed silane as an RCA coupling agent comprising 0.21% 3-methacryloxypropyltrimethoxysilane (Z-6030 available from Dow Corning, Midland, MI), 0.015% glacial acetic acid, 0.015% deionized water, and 0.07% ethanol, prehydrolyzed as described in Example 1 below.

Paragraph beginning at page 13, line 5, has been amended as follows:

A preferred embodiment of a cured coating mixture of the present invention is a cured coating made from a pre-cured coating mixture comprising, by weight, 79.44% of a resin mixture comprising, by weight, 53.4% urethane acrylate ([Alua] ALUA 1001, available from Congoleum Corporation, Mercerville, NJ), 8.8% ethoxylated diacrylate (SR 259 available from Sartomer, Exton, PA), 24.3% propoxylated diacrylate (SR 306 available from Sartomer, Exton, PA), 13.4% ethoxylated trimethylolpropane triacrylate (SR 454 available from Sartomer, Exton, PA), and 0.1% acylphosphine oxide ([Lucerin] LUCERIN TPO available from BASF); 12.00% flattening agent

comprising 5 micron nylon particles (Orgasol 2001 UD available from Elf Atochem, Philadelphia, PA); 6.25% texture-producing particles comprising 60 micron nylon 12 particles ([Orgasol] ORGASOL 2002 ES 6 available from Elf Atochem, Philadelphia, PA); 2.00% nanometer-sized alumina RCA having a particle size distribution in the range of 27-56 nm ([Nanotek Alumina] NANOTEK ALUMINA #0100 available from Nanophase Technologies Corp. Burr Ridge, IL); and 0.31% prehydrolyzed silane as an RCA coupling agent comprising 0.21% 3-methacryloxypropyltrimethoxysilane (Z-6030 available from Dow Corning, Midland, MI), 0.015% glacial acetic acid, 0.015% deionized water, and 0.07% ethanol, prehydrolyzed as described in Example 1 below.

Paragraph beginning at page 17, line 12, has been amended as follow:

EXAMPLE 1

This example describes a microscopic texture with good abrasion resistance, but poor cleanability. 60g of alumina (available as [Nanotek alumina] NANOTEK ALUMINA 0100 from Nanophase Technologies Corp., Burr Ridge, IL) having an average particle diameter range of 27-56 nm, 7.92g of prehydrolyzed 3-methacryloxypropyltrimethoxysilane (available as Z-6030 from Dow Corning, Midland, MI), 240g of a UV-curable resin (see Table 1 below for the resin composition), and about 200g of 0.5 in. diameter porcelain balls were added to a porcelain media mill.

Paragraph beginning at page 18, line 1, has been amended as follows:

Table 2: UV-Curable Resin Composition

Component	Manufacturer	Wt %
Urethane acrylate ([Alua] <u>ALUA</u> 1001)	Congoleum (Mercerville, NJ)	53.4
Ethoxylated diacrylate (SR 259)	Sartomer (Exton, PA)	8.8
Propoxylated diacrylate (SR 306)	Sartomer (Exton, PA)	24.2
Ethoxylated trimethylolpropane triacrylate (SR 454)	Sartomer (Exton, PA)	13.3
Surfactant (DC 193)	DOW Corning (Midland, MI)	0.1
Acylphosphine oxide ([Lucerin] <u>LUCERIN</u> TPO)	BASF	0.2

Paragraph beginning at page 18, line 17, has been amended as follows:

EXAMPLE 2

This example shows a coating with macroscopic texture having good cleanability and scratch resistance. 31.17g of silica (available as [Nanotek® silica] NANOTEK SILICA 2000 from Nanophase Technologies Corp., Burr Ridge, IL) having an average particle diameter range of 15-33 nm, 10.51g of prehydrolyzed 3-methacryloxypropyltrimethoxysilane (available as Z-6030 from Dow Corning, Midland, MI) prepared as described in Example 1, 100g of a UV-curable resin (see Table 2 below for resin composition). The mixture was hand stirred with a wooden spatula and then mixed with an ultrasonic probe for about 20 minutes. The pre-cured coating mixture was applied to flexible polyvinyl chloride floor substrates at room temperature with a spatula and distributed on the substrate with an air knife. These sheet vinyl substrates were then UV-cured under nitrogen (<500 ppm oxygen) using two H-bulbs set on high and a line speed of 100 fpm. Two passes under the lamps were made under these conditions. The resulting coating was transparent with a gloss value (at 60°) of about 11%. The coating also had a macroscopic wave-like texture and was found to be cleanable. A Taber scratch test consisting of scribing 5 concentric circles on the coated samples with a metal stylus weighted from 300 to 500g in 50g increments yielded no visible scratches on the coating surface. Using the qualitative scratch rating system, this coating was rated a 7.

Paragraph beginning at page 19, line 1, has been amended as follows:

Table 2: UV-Curable Resin Composition

Component	Manufacturer	Wt %
Urethane acrylate ([Alua] <u>ALUA</u> 1001)	Congoleum (Mercerville, NJ)	53.4
Ethoxylated diacrylate (SR 259)	Sartomer (Exton, PA)	8.8
Propoxylated diacrylate (SR 306)	Sartomer (Exton, PA)	24.2
Ethoxylated trimethylolpropane triacrylate (SR 454)	Sartomer (Exton, PA)	13.3
Surfactant (DC 193)	DOW Corning (Midland, MI)	0.1
Acylphosphine oxide ([Lucerin] <u>LUCERIN</u> TPO)	BASF	0.2

Paragraph beginning at page 19, line 22, has been amended as follows:

EXAMPLE 4

Tests were conducted to determine the effects of silane as a coupling agent on the dispersion of nanometer-sized alumina. 2g of [Nanotek® alumina] NANOTEK ALUMINA 0100 having an average particle diameter range of 27-56 nm was added to 10g of each of the following liquids: ethoxylated diacrylate (available as SR 259 from Sartomer, Exton, PA), propoxylated diacrylate (available as SR 306 from Sartomer, Exton, PA), ethoxylated trimethylolpropane triacrylate (available as SR 454 from Sartomer, Exton, PA), and urethane acrylate (available as [Alua] ALUA 1001 from Congoleum, Mercerville, NJ). The mixtures were stirred, shaken, and then placed into an ultrasonic bath for 30 minutes. To some of these mixtures 0.24g prehydrolyzed silane, as prepared in Example 1, was added, and the mixture was stirred. The consistencies of each of these mixtures are described in the Table 3 below.

Paragraph beginning at page 20, line 1, has been amended as follows:

Table 3: Effects of Prehydrolyzed Silane

Liquid	Dispersing Agent	Observations
SR 306	none	thixotropic paste
	silane	low viscosity liquid
SR 259	none	low viscosity liquid
	silane	low viscosity liquid
SR 454	none	thixotropic paste
	silane	low viscosity liquid
[Alua] <u>ALUA</u> 1001	none	non-thixotropic cream
	silane	low viscosity liquid

Paragraph beginning at page 28, line 3, has been amended as follows:

EXAMPLE 12

This example demonstrates the use of an organic RCA. 20g of an organic (castor wax derivative) RCA [Thixcin] THIXIN R (Rheox Inc., Hightstown, NJ) was added to 480g of the pre-cured UV resin described in Table 2 and mixed with a Cowles blade mixer. The mixture was then heated at 70°C until the [Thixcin] THIXCIN R dissolved. The mixture was then allowed to cool to room temperature. The viscosity of this mixture at a shear rate of 0.150 s⁻¹ at room temperature was 243,000 cPs. This mixture was then coated on flexible sheet vinyl using an air knife and cured under inert conditions. The resulting cured coating was transparent and had a wave-like macroscopic texture. When scratched using the Taber scratch test, no visible scratches were observed.

Paragraph beginning at page 28, line 14, has been amended as follows:

EXAMPLE 13

This example demonstrates the use of both an organic RCA and an inorganic flatting agent. 12g of [Thixcin] THIXCIN R organic RCA and 19.14g of [Acematte] ACEMATTE OK 412 (Degussa Corp.) silica flatting agent were added to 288g of the pre-cured UV resin described in Table 2 and mixed as in Example 12. This mixture was coated on a flexible vinyl sheet floor with an air knife and cured under both atmospheric and inert conditions. The resulting coating had a matte finish and wave-like texture.

Paragraph beginning at page 28, line 22, has been amended as follows:

EXAMPLE 14

This example shows that wave-like macroscopic texture can be generated without the use of an RCA. 85.25g of Alua 2302 and 21.31g [Alua] ALUA 1001 urethane acrylate oligomers (Congoleum Corp., Mercerville, NJ), 66.14g of [Actilane] ACTILANE 424 and 26.64g of [Actilane] ACTILANE 430 acrylate monomers (Akcros Chemicals, New Brunswick, NJ), 0.2g DC 193 surfactant, and 0.394g of [Lucerin] LUCERIN TPO photoinitiator were added to a container at room temperature. This mixture was heated to 70°C and mixed with a Cowles blade mixer. After cooling to room temperature, the pre-cured coating mixture was applied to flexible vinyl substrates, coated with an air knife, and UV-cured under inert conditions. The resulting coating was transparent and had macroscopic wave-like texture.

Paragraph beginning at page 28, line 33, has been amended as follows:

EXAMPLE 15

This example demonstrates the use of organic texture-producing particles and an inorganic flatting agent. 6.25g of [Orgasol] ORGASOL 2002 ES 6 NAT (Elf Atochem, Philadelphia, PA) polyamide 12 texture-producing particle (60 μ m in diameter) and 5.625 g of [Acematte] ACEMATTE OK 412 flatting agent (3 μ m diameter) were added to 88.125g of the pre-cured UV-resin described in Table 2 and mixed with a Cowles blade mixer. This mixture was heated to 70°C and coated on a flexible sheet vinyl floor using an air knife. The pre-cured coating

was cured at a line speed of 100 fpm using atmospheric and then inert conditions. The resulting coating was transparent coating with a matte finish and sandpaper-like texture.

Paragraph beginning at page 29, line 6, has been amended as follows:

EXAMPLE 16

This example shows the effects of the size of the texture-producing particles on the cured coating texture. Four pre-cured coating mixtures were prepared as in Example 15 where 6.25% of [Orgasol] ORGASOL 2002 polyamide 12 texture-producing particles was added to the pre-cured UV-resin described in Table 2. The four mixtures differed in that each contained a different sized particle of [Orgasol] ORGASOL 2002: 30 μm (grade ES 3), 40 μm (grade ES 4), 50 μm (grade ES 5), and 60 μm (grade ES 6). Each mixture was applied at 70°C to sheet vinyl and coated with an air knife. All coatings were UV-cured under inert conditions. The cured coating containing the 30 μm particles had a visibly fairly smooth surface with a matte finish. The coatings with the larger particles had progressively more visible texture as the particle size increased, where the 60 μm particles gave the most visible and aggressive (largest textural features) texture. The scratch resistance of the coatings improved with increasing particle size, where 60 μm showed almost no visible scratches after the Taber scratch test. FIG. 9 is a photograph of the top of a portion of the coated substrate produced using the 60 μm particles, and FIG. 10 is a photograph of the top of a portion of the coated substrate produced using the 40 μm particles. The difference in the aggressiveness of the texture is evident. It should be appreciated, however, that the concentration of particles used would also be expected to have an influence on textural aggressiveness.

Paragraph beginning at page 30, line 16, has been amended as follows:

EXAMPLE 17

This example describes textured coatings containing organic texture-producing particles, an inorganic RCA with a coupling agent, and both organic and inorganic flatting agents. Per-cured coating mixtures having the composition shown in Table 9 were mixed with a Cowles blade mixer.

Table 9: Pre-Cured Coating Mixture Compositions in Weight Percent

Component	Coating A	Coating B
UV-Curable Resin from Table 2	85.62	85.95
[Orgasol] ORGASOL 2002 ES 6 (60 μ m texture-producing particle)	6.12	6.25
[Orgasol] ORGASOL 2001 UD (5 μ m organic flatting agent)	6.0	0
[Acematte] ACEMATTE OK 412 (3 μ m inorganic flatting agent)	0	5.49
[Nanotek Alumina] <u>NANOTEK ALUMINA</u> (inorganic RCA)	1.96	2
Prehydrolyzed Z-6030 (coupling agent from Example 1)	0.30	0.31

Both coatings were applied to flexible sheet vinyl at 70°C and coated with an air knife. These coated substrates were UV-cured under atmospheric and then inert environments. The resulting cured coatings were transparent and had sandpaper-like macroscopic texture and matte finishes.

In the Claims:

Claim 7 and 17 have been canceled.

Claims 1-6, 8-16, 18-23 have been amended as follows:

1. (Amended Once) A pre-cured coating mixture, comprising:
a radiation-curable resin; and
an initiator;

wherein said radiation-curable resin and said initiator form a pre-cured coating mixture having a viscosity of approximately 100,000-1,000,000 cPs at a shear rate of 0.150 s⁻¹ that is capable of forming a macroscopic texture upon application of said pre-cured coating mixture on a substrate.

2. (Amended Once) The pre-cured coating mixture of claim 1 wherein said radiation-curable resin comprises radiation-curable oligomers and monomers comprising approximately 1-20 radiation-curable groups per molecule.

3. (Amended Once) The pre-cured coating mixture of claim 2 wherein said radiation-curable groups are selected from the group consisting of acrylate, oxirane, vinyl ether, hydroxyl, lactone, and mixtures thereof.

4. (Amended Once) The pre-cured coating mixture of claim 1 wherein said radiation-curable resin is selected from the group consisting of radiation-curable urethane acrylate, radiation-curable ethoxylated diacrylate, radiation-curable propoxylated diacrylate, radiation-curable ethoxylated trimetholpropane triacrylate, [radiation-curable acylphosphine oxide,] and mixtures thereof.

5. (Amended Once) The pre-cured coating mixture of claim 1 wherein said radiation-curable resin comprises approximately 50-99%, by weight, of said pre-cured coating mixture.

6. (Amended Once) The pre-cured coating mixture of claim 1 wherein said initiator is selected from the group consisting of a free radical photoinitiator, a cationic photoinitiator, and mixtures thereof.

8. (Amended Once) The pre-cured coating mixture of claim 1 further comprising a rheological control agent, [and] wherein said radiation-curable resin, said initiator, and said rheological control agent form said pre-cured coating mixture having a viscosity of approximately 100,000-1,000,000 cPs at a shear rate of 0.150 s⁻¹ that is capable of forming a macroscopic texture upon application of said pre-cured coating mixture on a substrate.

9. (Amended Once) The pre-cured coating mixture of claim 8 wherein said rheological control agent is selected from the group consisting of inorganic particles, organic solids, and mixtures thereof.

10. (Amended Once) The pre-cured coating mixture of claim 9 wherein said rheological control agent comprises inorganic particles [are] selected from the group consisting of alumina, silica, fumed alumina, fumed silica, aluminosilicate, alumina coated on silica, metal oxides, metal, carbonates, clays, and mixtures thereof.

11. (Amended Once) The pre-cured coating mixture of claim 9 wherein said rheological control agent comprises inorganic particles [have] having an approximate size in the range from 27-56 nanometers.

12. (Amended Once) The pre-cured coating mixture of claim 9 wherein said rheological control agent comprises inorganic particles [are] comprising nanometer-sized alumina.

13. (Amended Once) The pre-cured coating mixture of claim 9 wherein said rheological control agent comprises inorganic particles [are] comprising aluminosilicates.

14. (Amended Once) The pre-cured coating mixture of claim 9 wherein said rheological control agent comprises inorganic particles [comprise] comprising approximately 1-80%, by weight, of said pre-cured coating mixture.

15. (Amended Once) The pre-cured coating mixture of claim 9 wherein said rheological control agent comprises organic solids [are] selected from the group consisting of low molecular weight waxes, polymers of ethylene glycol, polymers of propylene glycol, natural polymers, polyamides, polypropylene, and mixtures thereof.

16. (Amended Once) The pre-cured coating mixture of claim 9 wherein said rheological control agent comprises organic solids [comprise] comprising approximately 1-50%, by weight, of said pre-cured coating mixture.

18. (Amended Once) The pre-cured coating mixture of claim [15] 2 further comprising a coupling agent.

19. (Amended Once) The pre-cured coating mixture of claim 1 further comprising a plurality of texture-producing particles [having an effective size to form the macroscopic texture].

20. (Amended Once) The pre-cured coating mixture of claim [1] 57 further comprising:
a flattening agent comprising 5 micron-sized nylon particles;
[a plurality of texture-producing particles comprising 60 micron-sized nylon 12 particles;
a rheological control agent comprising a plurality of alumina particles having a particle size distribution in the range of 27-56 nanometers;]
[a coupling agent comprising prehydrolyzed silane;] and
wherein said radiation-curable resin comprises a mixture of urethane acrylate, ethoxylated diacrylate, propoxylated diacrylate, and ethoxylated trimethylolpropane triacrylate, and wherein said initiator comprises acylphosphine oxide.

21. (Amended Once) The [coated substrate] pre-cured coating mixture of claim [19] 46 wherein said plurality of texture-producing particles are selected from the group consisting of glass, ceramic, alumina, silica, aluminosilicates, alumina coated on silica, polyamide, polypropylene, polyethylene, polytetrafluoroethylene, ethylene copolymers, waxes, epoxy, urea-formaldehyde, nylon, and mixtures thereof.

22. (Amended Once) The [coated substrate] pre-cured coating mixture of claim [21] 46 wherein said plurality of texture-producing particles [is] comprises nylon 12.

23. (Amended Once) The [coated substrate] pre-cured coating mixture of claim [19] 46 wherein said plurality of texture-producing particles have a diameter of approximately [40] 30-350 microns.

Claims 46-58 have been added:

46. (New) A pre-cured coating mixture, comprising:
a radiation-curable resin;
an initiator;
a rheological control agent;

a plurality of texture-producing particles; and

wherein said radiation-curable resin, said initiator, said rheological control agent, and said plurality of texture-producing particles form a pre-cured coating mixture capable of forming a macroscopic texture upon application of said pre-cured coating mixture on a substrate.

47. (New) The pre-cured coating mixture of claim 46 wherein said rheological control agent is selected from the group consisting of inorganic particles, organic solids, and mixtures thereof.

48. (New) The pre-cured coating mixture of claim 47 wherein said rheological control agent comprises inorganic particles selected from the group consisting of alumina, silica, fumed alumina, fumed silica, aluminosilicate, alumina coated on silica, metal oxides, metal, carbonates, clays, and mixtures thereof.

49. (New) The pre-cured coating mixture of claim 47 wherein said rheological control agent comprises inorganic particles having an approximate size in the range from 27-56 nanometers.

50. (New) The pre-cured coating mixture of claim 47 wherein said rheological control agent comprises inorganic particles comprising nanometer-sized alumina.

51. (New) The pre-cured coating mixture of claim 47 wherein said rheological control agent comprises inorganic particles comprising aluminosilicates.

52. (New) The pre-cured coating mixture of claim 47 wherein said rheological control agent comprises inorganic particles comprising approximately 1-80%, by weight, of said pre-cured coating mixture.

53. (New) The pre-cured coating mixture of claim 47 wherein said rheological control agent comprises organic solids selected from the group consisting of low molecular weight waxes, polymers of ethylene glycol, polymers of propylene glycol, natural polymers, polyamides, polypropylene, and mixtures thereof.

54. (New) The pre-cured coating mixture of claim 47 wherein said rheological control agent comprises organic solids comprising approximately 1-50%, by weight, of said pre-cured coating mixture.

55. (New) The pre-cured coating mixture of claim 47 further comprising a coupling agent.

56. (New) The pre-cured coating mixture of claim 46 wherein said pre-cured coating mixture has a viscosity of approximately 100,000-1,000,000 cPs at a shear rate of 0.150 s^{-1} .

57. (New) The pre-cured coating mixture of claim 46 further comprising:
a coupling agent comprising prehydrolyzed silane; and
wherein said plurality of texture-producing particles comprises 60 micron-sized nylon 12 particles and said rheological control agent comprises a plurality of alumina particles having an approximate size in the range of 27-56 nanometers.

58. (New) The pre-cured coating mixture of claim 57 further comprising:
a flatting agent comprising 3 micron-sized nylon particles; and
wherein said radiation-curable resin comprises a mixture of urethane acrylate, and ethoxylated trimethylolpropane triacrylate, and wherein said initiator comprises acylphosphine oxide.

ENTIRE SET OF PENDING CLAIMS

1. (Amended Once) A pre-cured coating mixture, comprising:
a radiation-curable resin; and
an initiator;

wherein said radiation-curable resin and said initiator form a pre-cured coating mixture having a viscosity of approximately 100,000-1,000,000 cPs at a shear rate of 0.150 s^{-1} that is capable of forming a macroscopic texture upon application of said pre-cured coating mixture on a substrate.

2. (Amended Once) The pre-cured coating mixture of claim 1 wherein said radiation-curable resin comprises radiation-curable oligomers and monomers comprising approximately 1-20 radiation-curable groups per molecule.

3. (Amended Once) The pre-cured coating mixture of claim 2 wherein said radiation-curable groups are selected from the group consisting of acrylate, oxirane, vinyl ether, hydroxyl, lactone, and mixtures thereof.

4. (Amended Once) The pre-cured coating mixture of claim 1 wherein said radiation-curable resin is selected from the group consisting of radiation-curable urethane acrylate, radiation-curable ethoxylated diacrylate, radiation-curable propoxylated diacrylate, radiation-curable ethoxylated trimethylolpropane triacrylate, and mixtures thereof.

5. (Amended Once) The pre-cured coating mixture of claim 1 wherein said radiation-curable resin comprises approximately 50-99%, by weight, of said pre-cured coating mixture.

6. (Amended Once) The pre-cured coating mixture of claim 1 wherein said initiator is selected from the group consisting of a free radical photoinitiator, a cationic photoinitiator, and mixtures thereof.

8. (Amended Once) The pre-cured coating mixture of claim 1 further comprising a rheological control agent, wherein said radiation-curable resin, said initiator, and said rheological control agent form said pre-cured coating mixture having a viscosity of approximately 100,000-1,000,000 cPs at a shear rate of 0.150 s^{-1} that is capable of forming a macroscopic texture upon application of said pre-cured coating mixture on a substrate.

9. (Amended Once) The pre-cured coating mixture of claim 8 wherein said rheological control agent is selected from the group consisting of inorganic particles, organic solids, and mixtures thereof.

10. (Amended Once) The pre-cured coating mixture of claim 9 wherein said rheological control agent comprises inorganic particles selected from the group consisting of alumina, silica, fumed alumina, fumed silica, aluminosilicate, alumina coated on silica, metal oxides, metal, carbonates, clays, and mixtures thereof.

11. (Amended Once) The pre-cured coating mixture of claim 9 wherein said rheological control agent comprises inorganic particles having an approximate size in the range from 27-56 nanometers.

12. (Amended Once) The pre-cured coating mixture of claim 9 wherein said rheological control agent comprises inorganic particles comprising nanometer-sized alumina.

13. (Amended Once) The pre-cured coating mixture of claim 9 wherein said rheological control agent comprises inorganic particles comprising aluminosilicates.

14. (Amended Once) The pre-cured coating mixture of claim 9 wherein said rheological control agent comprises inorganic particles comprising approximately 1-80%, by weight, of said pre-cured coating mixture.

15. (Amended Once) The pre-cured coating mixture of claim 9 wherein said rheological control agent comprises organic solids selected from the group consisting of low molecular weight

waxes, polymers of ethylene glycol, polymers of propylene glycol, natural polymers, polyamides, polypropylene, and mixtures thereof.

16. (Amended Once) The pre-cured coating mixture of claim 9 wherein said rheological control agent comprises organic solids comprising approximately 1-50%, by weight, of said pre-cured coating mixture.

18. (Amended Once) The pre-cured coating mixture of claim 9 further comprising a coupling agent.

19. (Amended Once) The pre-cured coating mixture of claim 1 further comprising a plurality of texture-producing particles.

20. (Amended Once) The pre-cured coating mixture of claim 57 further comprising:
a flatting agent comprising 5 micron-sized nylon particles; and
wherein said radiation-curable resin comprises a mixture of urethane acrylate, ethoxylated diacrylate, propoxylated diacrylate, and ethoxylated trimethylolpropane triacrylate, and wherein said initiator comprises acylphosphine oxide.

21. (Amended Once) The pre-cured coating mixture of claim 46 wherein said plurality of texture-producing particles are selected from the group consisting of glass, ceramic, alumina, silica, aluminosilicates, alumina coated on silica, polyamide, polypropylene, polyethylene, polytetrafluoroethylene, ethylene copolymers, waxes, epoxy, urea-formaldehyde, nylon, and mixtures thereof.

22. (Amended Once) The pre-cured coating mixture of claim 46 wherein said plurality of texture-producing particles comprises nylon 12.

23. (Amended Once) The pre-cured coating mixture of claim 46 wherein said plurality of texture-producing particles have a diameter of approximately 30-350 microns.

46. (New) A pre-cured coating mixture, comprising:

a radiation-curable resin;

an initiator;

a rheological control agent;

a plurality of texture-producing particles; and

wherein said radiation-curable resin, said initiator, said rheological control agent, and said plurality of texture-producing particles form a pre-cured coating mixture capable of forming a macroscopic texture upon application of said pre-cured coating mixture on a substrate.

47. (New) The pre-cured coating mixture of claim 46 wherein said rheological control agent is selected from the group consisting of inorganic particles, organic solids, and mixtures thereof.

48. (New) The pre-cured coating mixture of claim 47 wherein said rheological control agent comprises inorganic particles selected from the group consisting of alumina, silica, fumed alumina, fumed silica, aluminosilicate, alumina coated on silica, metal oxides, metal, carbonates, clays, and mixtures thereof.

49. (New) The pre-cured coating mixture of claim 47 wherein said rheological control agent comprises inorganic particles having an approximate size in the range from 27-56 nanometers.

50. (New) The pre-cured coating mixture of claim 47 wherein said rheological control agent comprises inorganic particles comprising nanometer-sized alumina.

51. (New) The pre-cured coating mixture of claim 47 wherein said rheological control agent comprises inorganic particles comprising aluminosilicates.

52. (New) The pre-cured coating mixture of claim 47 wherein said rheological control agent comprises inorganic particles comprising approximately 1-80%, by weight, of said pre-cured coating mixture.

53. (New) The pre-cured coating mixture of claim 47 wherein said rheological control agent comprises organic solids selected from the group consisting of low molecular weight waxes,

polymers of ethylene glycol, polymers of propylene glycol, natural polymers, polyamides, polypropylene, and mixtures thereof.

54. (New) The pre-cured coating mixture of claim 47 wherein said rheological control agent comprises organic solids comprising approximately 1-50%, by weight, of said pre-cured coating mixture.

55. (New) The pre-cured coating mixture of claim 47 further comprising a coupling agent.

56. (New) The pre-cured coating mixture of claim 46 wherein said pre-cured coating mixture has a viscosity of approximately 100,000-1,000,000 cPs at a shear rate of 0.150 s^{-1} .

57. (New) The pre-cured coating mixture of claim 46 further comprising:
a coupling agent comprising prehydrolyzed silane; and

wherein said plurality of texture-producing particles comprises 60 micron-sized nylon 12 particles and said rheological control agent comprises a plurality of alumina particles having an approximate size in the range of 27-56 nanometers.

58. (New) The pre-cured coating mixture of claim 57 further comprising:
a flatting agent comprising 3 micron-sized nylon particles; and

wherein said radiation-curable resin comprises a mixture of urethane acrylate, and ethoxylated trimethylolpropane triacrylate, and wherein said initiator comprises acylphosphine oxide.